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AMERICAN DYESTUFF REPORTER

Vol. VIII, No. 18
May 2, 1921

In 2 Sections
Section 1

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AMERICAN DYESTUFF REPORTER

Woolworth Bldg., New York City

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AMERICAN DYESTUFF REPORTER

A Weekly Publication devoted to

DYESTUFFS, COLORS and ALLIED CHEMICALS

"Circulated Everywhere Dyestuffs Are Used"

In Two Sections—Section 1

Vol. 8 New York, May 2, 1921 No. 18

THE FIGHT HAS BEEN WON!

Dramatic Developments of Past Week Sweep Away Uncertainty as to Fate of Dye Industry, Which, for the First Time, Is Now a Sound Investment Instead of a Speculation

"I UNDERSTAND you and Jim are going to address the American Chemical Society. Well, you can tell the members that what they need more than addresses is protection—and they are going to get it."

The reader will please take a long, satisfying glance at the words written above. They happen to mean a very great deal. Friends of the cause of the dye industry—which means all of us with a few unimportant exceptions—may well breathe a sigh of relief and draw from them more genuine cheer than from almost any which have been uttered these two years past. Many men during that time have spoken or written words of similar import, but the utterances have carried no positive guarantee, have lacked the weight of an authority high enough to redeem them on demand at their face value. A little more than a week ago, however, they went to par, and there they will remain until maturity, for they were addressed to Representative Nicholas Longworth, father of the Dye bill and in charge of the new dye measure to be included in the forthcoming general tariff program, on the eve of his departure to speak at the Spring Meeting of the American Chemical Society at Rochester; the "Jim" referred to was Senator James W. Wadsworth, who accompanied Mr. Longworth and also addressed the gathering of chemists — and the speaker was President Harding!

We do not believe that it would be in the least degree unduly optimistic to construe the President's remarks to mean that the uncertainties over the ultimate fate of the dye industry's case are at last dispensed with, once and for all, and that the triumph of the advocates of rigorous protection is complete and final. For if there is anyone in the country endowed with the necessary power to bring about the fulfilment of the promise contained in those few lines, that man is the President. He is leader of his party, and his party controls Congress by an ample majority. The disposition of both House and Senate is, moreover, favorable; Mr. Longworth is aggressively behind the dye indus-

try in its fight for justice, and altogether the various signs and portents could scarcely be more auspicious.

Another press account of the semi-official interview makes President Harding say: "May I suggest that what the industry needs more than addresses is protection?—and with that sentiment I am heartily agreed." Same thing; you may take your choice between the two versions. We do not imagine that Messrs. King, Moses and others of the opposition will find much to encourage them in either—nor will the laboring lobbyists.

But this is not the only big news in a week replete with big news. Another worry has been almost swept from the minds of the dye men by the action of Senator Knox in introducing a measure somewhat similar to the "Penrose Pacifier" of the winter of 1919-20. There has been no little apprehension in dyestuff circles over the rapid approach of the enactment of the Knox Peace Resolution, which would have automatically dissolved the War Trade Board and thus left the American dye markets utterly unprotected against the Cartel for many months—for it is not thought that the general tariff program which will contain the new Longworth bill can be completed and passed before next November or December. Accordingly, an amendment to the proposed Emergency Tariff bill was drawn and submitted to the committee in charge of the measure, transferring to the Treasury Department the dye-licensing functions of the War Trade Board, providing for the continuation of all licenses granted by the Board prior to its dissolution, and proposing an appropriation of $50,000 to carry on the work.

Senator Knox responded in a manner both prompt and gratifying, and, after declaring that something of the sort would certainly have been included in his Peace Resolution had it not been that he had mistakenly supposed the dye industry to have been provided for through other special legislation, offered the amendment as follows:

"Provided, further, That on and after the day following the passage of this act, for a period of six months, no sodium nitrate, dyes, dyestuffs, including crudes, intermediates and other products derived directly or indirectly from coal tar and no finished or partly finished products, mixtures and compounds of coal-tar products, and no other synthetic organic drugs, or synthetic organic chemicals, shall be admitted to entry or delivered from customs custody in the United States or in any of its possessions unless the Secretary of the Treasury shall determine that such article or a satisfactory substitute therefor is not obtainable in the United States or in any of its possessions on reasonable terms as to quality, price and delivery, and that such article in the quantity to be admitted is required for consumption within six months by an actual consumer in the United States or in any of its possessions, and the Secretary of the Treasury may make all rules and regulations necessary and proper for the accomplishment of the purposes of this proviso. And upon the day following the approval of this act the War Trade Board section of the Department of State shall cease to exist; all clerks and employees of the said War Trade Board section shall be transferred to and become clerks and employees of the Treasury Department; all books, documents and other records of the said War Trade Board section shall become books, documents and records of the Treasury Department; all individual licenses issued by the said War Trade Board section prior to the passage of this act shall remain in effect and the importation under such licenses shall be permitted; all unexpended funds and appropriations for the use and maintenance of the said War Trade Board section shall become funds and appropriations available to be expended by the Secretary of the Treasury in the exercise of the power and authority conferred

upon him by this proviso, and for the carrying out of the purposes of this provision during the fiscal year ending June 30, 1922, the sum of $50,000 is hereby appropriated."

This amendment to the Emergency Tariff bill is to the dye industry about what the bill itself is to a host of other industries. It will form a temporary stop-gap until the general tariff in its final form can be arranged and presented. If the Senate should balk at passing it, the industry would indeed be in a bad way—but once again without being unduly optimistic, it may safely be said that such a contingency is so remote as not to cause a moment's uneasiness. It is not at all reasonable to suppose that the Senate would withhold from the industry the chance to continue as it is at least until it can be officially determined just what protection it shall receive in future years. There was no trouble at all about passing the Penrose Resolution at a time when the Senate was far more rushed than it is to-day, and there will be no trouble about passing the Knox amendment for the same reason that our courts do not hang a man and then try him afterwards. The Senate well knows that to allow the dye industry to go unprotected from July 1, say, until next December, would leave little if anything to protect when it finally got around to the general tariff legislation.

Beyond a doubt the reader has already grasped the true significance of the foregoing array af facts. However, here it is as The Reporter views it: With the certainty that the Senate will oblige in the matter of the Knox amendment, and with President Harding's assurances to Mr. Longworth, the American dye industry, as the result of these developments of the week, is at last as safe as though the original Dye bill had just been passed. This may be asserted with entire confidence. For the first time

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Our products are made to definite standards. These standards are fixed not arbitrarily, but by careful study of the needs of American chemical and dyestuff manufacturers. Our aim is to supply the grade of material best adapted for each kind of work.

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The Barrett Company

Chemical Department

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the trade may feel justified in concluding: The Fight Has Been Won! Equally important, the industry has almost overnight become a sound investment instead of a speculation.

The REPORTER feels that it is not acting prematurely in offering to the industry, to consumers, and to the country at large, its heartiest congratulations.

Philadelphia, New Hampshire and Colorado papers please copy!

STATISTICS OF U. S. IMPORTS OF DYES BY CLASSES DURING 1920

Rochester, N. Y., April 28.—The following statistics on imports of dyes during 1920 were presented to the Dye Division of the American Chemical Society to-day. They were prepared by Dr. C. R. Long, chemist for the U. S. Tariff Commission, as follows:

TOTAL IMPORTS OF COAL-TAR DYES DURING CALENDAR YEAR 1920 —3,700,000 POUNDS

Vat dyes other than Indigo, 855,000 lbs.	(lbs.)
Indanthrene Blue GCD (or 18% of total for this class)	150,000
Indanthrene Yellow R and G.	about 10% total
Indanthrene Black BB	about 10% total
Bromindigo	34,000
Ciba Scarlet	25,000
Hydron Blue	20,000
Ciba Violet B	18,000
Mordant and chrome dyes, 840,000 lbs.	
Anthracene Blue WR (or 13% of total for this class)	114,000
Alizarine (or 9% of total)	73,000
Brilliant Delphine Blue BS	29,000
Eriochrome Blue Black B	20,000
Omega Brown PB	11,000
Acid dyes, 765,000 lbs.	
Wool Green S (or 16% of total for this class)	127,000
Patent Blue and Patent Blue A (or 12% of total)	86,000
Xylene Light Yellow 2G and R.	about 10% total (lbs.)
Tartrazine	57,000
Quinoline	35,000
Xylene Light Blue VS	26,000
Acid Violet 4BN	22,000
Direct dye, 595,000 lbs.	
Zambesi Black (or 7%)	about 40,000
Trisulfon Brown B and MB (or 7%)	about 40,000
Trisulfon Brown GG (or 7%)	about 40,000
Chloramine Brilliant Red 8B (or 4%)	about 23,000
Heligoland Black (or 4%)	about 23,000
Pyragol Orange G (or 4%)	about 23,000
Sulphur dyes, 255,000 lbs.	
Thionol Red Brown (or 15%)	38,000
Thionol Green DY (or 10%)	24,000
Basic dyes, 200,000 lbs.	
Auramine (or 45%)	85,000
Phosphine (or 10%)	20,000
Indigo, 171,000 lbs.	

The above figures are approximate, and under each class only the more important dyes have been listed.

SAYS DOMESTIC DYE COMPETITION HAS BEEN WHOLLY ELIMINATED BY THE GERMANS

There is in Germany to-day a single giant chemical trust which combines under one unified operating body all the chemical and dyestuff factories which were before the war controlled by three competing groups, declares Dr. O. B. May, of the May Chemical Works, Newark, N. J., in a recent article written upon his return after an extended tour of the industrial centers of Germany.

This combination concentrates into the hands of a single group enough power to make the largest previously existing industrial organization appear insignificant by comparison, he says.

The giant combine has the entire German market, as well as the foreign market, divided into territories among its members so as to avoid any possible clash of interests and any possible competition in prices.

Scientific system and management in this chemical and dye trust is carried to unheard-of extremes, Dr. May continues, not only in the selling but also in the manufacturing end. Every branch of the industry has a certain minimum standard of attainable perfection which must be achieved. In case it is not, the management of that

department is marked as inefficient and eventually replaced by better fitted leaders.

This German trust is well able and ready to sustain losses in new foreign markets for a year or two at the beginning in order to get the business, which is the chief consideration at present. Because of their scientific and systematic management and the low value of the mark they will be a most formidable rival to similar industries in other countries. Dr. May is emphatic in his belief that from what he has seen of the German chemical trust and their methods during his recent trip American industries will need protection, and that without it they will perish in competition with the Germans.

BRITISH DYESTUFFS IS TO "CARRY ON" IN RESEARCH

At the recent meeting of British Dyestuffs, Ltd., the chairman outlined plans for company research as follows:

"During the debates on the Dyestuffs bill some of our critics in both Houses of Parliament and in the press suggested that the importance of research was being or would be overlooked by our corporation. Need I say that this is quite untrue? I wish to assure the shareholders and the public that the board is very much alive to the vital necessity for continuous research in our industry. We realize that we must insure that all the processes we use are operated with the maximum efficiency, and for this purpose they require almost continuous examination in order that every possible improvement may be discovered and be made use of. We realize that, so far as we have not done so already (and we have, in fact, made great progress in this direction), we must discover and perfect the processes which are necessary to enable us to manufacture those foreign dyes which are needed by dye users but which at present are not made here. Finally, we realize that we must not be content to copy. We must allow free play to the inventive genius and initiative of British chemists—so that we may ultimately lead and not follow.

"All this is the work of the research department, and it is upon these lines that our research department is working. You will see from the report that we have spent upon research, during the first two years of the corporation's existence, £289,366. This sum includes the large capital expenditure which is necessary to lay the foundations of a permanent research organization. You will observe that in the balance sheet we have a reserve fund of £100,000 for research. As I told you last year, we are fortunate enough to have at the head of this branch of our activities two eminent chemists—both of them Fellows of the Royal Society—Dr. Green and Dr. Robinson. Working under them are many zealous and promising chemists.

CHEMCO FOR CHEMCO

LEVEL DYEING ACID COLORS

Consult

The Chemical Company of America, Inc.

46 Murray Street, New York City

AMERICAN DYESTUFF REPORTER
Published weekly by
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A. P. HOWES, President
LAURANCE T. CLARK, Editor

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THE PROPOSED "SELECTIVE EMBARGO" ON FOREIGN DYES

Speaking before the American Chemical Society at Rochester Representative Longworth had this to say of future plans for the protection of the American dye industry:

"The bill which I introduced in the last Congress and which passed the House but never got through the Senate, I propose to put bodily into the chemical schedule, except that instead of having the license feature as written in that bill it will be changed into a selective embargo.

"The proposition of the license, of the main license, as Dr. Herty and others will know, does not sound well to many American business men; they don't like to have to get a license to import chemicals. It is proposed that the Tariff Commission should make a list of dyes not importable under any condition, another of those importable under certain conditions, and another of those importable under any condition.

"Roughly speaking, those dyes which Germany makes, which we make here at reasonable prices and in reasonable quantities, are not to be permitted to come into this country at all. Those that are produced here, but in limited quantities, and where delivery might not be certain, may be imported under certain conditions and in certain quantities; and dyes not produced here may be imported."

This statement would appear to give the industry and the nation quite all that could be asked for. The press account, however, leaves a doubt in one's mind as to the status of dyes not being made by Americans at the time of the passage of the act but which may be subsequently produced and placed upon the market.

The press does not quote Mr. Longworth as saying that in such cases, these colors are to be stricken from the list of "dyes not importable under any condition" or the list of "dyes importable under certain conditions" during the life of the law. And if this is not specifically agreed upon and made a part of the new measure, the dye industry will not have that incentive to experiment with new dyes which the licensing system would give it.

But it is more than probable that Mr. Longworth means his selective lists to be subject to change at the discretion of whatever body is to be charged with the administration of the law, in which case its effects would in no way be different from those of a licensing system except that no importer will be required to go through the formality of applying for a license—which would be an advantage.

In this event, the proposed law would be acceptable to the industry and the country; the point is merely raised here to indicate that the industry will want that assurance before giving it complete approval.

SENATOR KING AND THE D. A. R.

Had it not been for the sudden shift last week in the fortunes of the dye industry from irritating doubts to pleasing certainties, we might have become greatly excited over the recent public exhibition of Senator William H. King, of Utah, staged in Washington by Senator William H. King and displaying Senator William H. King in a bit of clowning evidently conceived and executed for the benefit of such representatives of the Cartel as happened to be present. As it is, however, we are willing to cite it as the World's Worst Example of Effrontery and let it go at that.

The daughters of the American Rev-

olution, holding a convention in the capital city, passed a resolution favoring an embargo on German dyes.

Whereat Senator William H. King, who subscribes to several newspapers and had read the resolution, raised his hands in pious horror. Then he assumed an expression of deep regret and declared that, alas, there could be no doubt of it; the "dye monopoly" of America had succeeded in hoodwinking the D. A. R. into becoming a vehicle for the spread of its "propaganda"; the D. A. R. was unquestionably being "used."

Senator King read a letter to his colleagues, which he said had been written by a prominent resident of Washington, protesting hotly against the D. A. R. lending itself for the circulation of propaganda "for a monopoly in which the Du Pont interests have a large part."

Then the Senator went on to say that the D. A. R. had become an agency "for the bombardment of Congress in behalf of the dye monopoly."

Senator Thomas used to do much better than that. So did Senator Moses, before the time when he and his coworkers got hopelessly tangled up in trying to prove the "world monopoly" planned by Du Pont and Levinstein. Perhaps the Senator himself was aware of the shortcomings of this, his latest device, but feeling called upon to dig up something, did his sorry best and now can borrow a line from Touchstone: "A poor thing, but mine own."

The others at least succeeded in creating a little cheap sensationalism, whereas Senator King has only succeeded in being clumsily insulting to a group of patriotic women who are showing their patriotism in an enlightened manner not to be surpassed by any of the men's organizations.

All honor to the D. A. R. for its intelligent recognition of a fundamental need, and for its praiseworthy action in exercising its legitimate privilege of public expression of sympathy with those striving to fill that need.

And may Senator King's very silly

COLORS Acid—Mordant—Basic Direct—Sulphur
INTERMEDIATES
SIZING MATERIALS
COTTON FINISHES
TURKEY RED OILS
SOLUBLE OILS

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Reg. U.S. Pat. Off.

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Charlotte *San Francisco*

attempt to discredit the action of that organization be received with the disappoving silence it so patently calls for.

ATMOSPHERIC HUMIDITY IN ITS RELATION TO ELECTRICAL PHENOMENA IN TEXTILE MATERIALS

The modern view of static or so-called frictional electricity is that it is an intensification of the feeble, natural surface electrification produced by the intimate contact which occurs during friction or when two bodies are pressed together. This intensification or heaping up of the natural surface charge can only occur on a body which is a non-conductor of electricity. The conductivity of textile materials depends upon the amount of moisture they contain—which in turn depends upon the humidity of the atmosphere to which they are exposed. Thus, wool exposed to an atmosphere of 73 per cent humidity at 65 deg. Fahr. will contain about 16 per cent moisture ("regain") and will normally exhibit little electrification. Wool exposed to an atmosphere of 25 per cent humidity at 65 deg. Fahr. will contain about 8.5 per cent moisture, and will be readily electrified. Further, for a fixed percentage humidity of the atmosphere the equilibrium condition is greater the lower the temperature. In spite of this fact the electrification of wool increases as the temperature is lowered below 60 deg. Fahr., owing to the resultant harshness of the fiber. The most suitable degree of humidity varies for the different processes. In the case of cotton, for the processes preparatory to spinning, a humidity of 62 per cent, at temperatures from 70 to 80 deg. Fahr., is most suitable. For spinning, rather less humidity—52 per cent, at 80 to 90 deg. Fahr.—is required. For worsted drawing a humidity of 70 per cent is sufficient to diminish very largely electrical effects in normal cases. As such a degree of humidity causes trouble in spinning from other causes, about 50 per cent is more suitable.

Though humidification diminishes electrical effects, it does not always effect a perfect cure. In worsted drawing and spinning trouble may occur even in humid atmospheres if the wool fiber, owing to its previous treatment, has been brought into a readily electrifiable state, and this trouble is aggravated by increased speed of machinery. Conversely, the wool fiber may be brought into such a state that it does not electrify appreciably even in comparatively dry atmospheres.—*Fiber & Fabric.*

DYEING OF ARTIFICIAL FLOWERS AND MILINERY GOODS

By J. H. Halliday

Dyeing Horse Hair for Aigrettes

Horse hair for this purpose should be dyed cold with basic dyes in an alcoholic solution of shellac. Make a stock solution by dissolving white shellac in alcohol to about the thickness of varnish. Also dissolve the dye in alcohol. The horse hair must be straight and all water must be avoided in dyeing, as it will cause the hair to curl. Introduce the hair in the above-mentioned alcohol bath of dye and shellac, care being taken that the hairs do not stick together when it is dried. Hair should be maintained in this solution until the desired color is obtained, and then removed and shaken until it is thoroughly dry.

Natural Grass

Before dyeing, soak the grass in boiling water to soften it. Then rinse in cold water and squeeze out all the surplus water. Dye the grass in a solution of basic dyes with the addition of Glauber's salts. Rinse well and dry. The grass thus dyed will be brittle, and to overcome this and to soften it and make it pliable soften it for about one-half hour in a bath composed of two-thirds water and one-third glycerine. Remove the grass, squeeze out the surplus liquor and dry.

Peps of Seeds

White peps or seeds are dyed in a bath composed of alcohol and the desired color, care being taken that there is no water present, as this will cause the stems to twist and make them unsuitable for future use. These products can also be dyed in the same manner as horse hair.

Muslin Tubing

Muslin tubing is dyed in the same manner as peps or seeds, except that it must be hung up until dry.

White Covered Cotton Wire

White covered cotton wire is dyed with basic dyes and also some of the acid dyes in the same manner as the peps or seeds, care being taken to dry it as quickly as possible, in order to prevent the wire from rusting.

Wool Slubbing

Wool slubbing, used for the centers of roses or daisies, is generally dyed with acid colors. The slubbing is made into hanks or skeins, placed upon sticks and introduced into a cold bath consisting of the dyestuff, 10 per cent Glauber's salt and 5 per cent to 10 per cent sulphuric acid. Bring slowly to the boiling point and boil until the bath is exhausted. Care should be taken to avoid violent boiling, as this will cause the slubbing to felt.

Jack Muslin

Dye the muslin in a water solution of eosine or erythrosine, according to the shade desired. Introduce the wet muslin in a solution consisting of four ounces of sugar of lead to one gallon of water. Frame and dry. Make a solution of jack paste (pigment colors) of the shade desired with the whites of eggs thoroughly beaten. Use enough whites of eggs to keep the solution from rubbing off the muslin when dry. Sugar may be used instead of the whites of eggs, but the results are not as satisfactory. Apply the solution of jack paste to the face of the muslin with a soft flat brush, being careful not to brush too hard, as this will force the paste through to the back of the muslin.—*Textile Colorist.*

The Baltimore Dyeing & Finishing Company, Baltimore, Md., has filed notice of change of name to the Meadowbrook Works, Inc.

Dr. Carl I. Alsberg, chief of the Bureau of Chemistry, U. S. Department of Agriculture, has resigned, to take effect June 1. Dr. Alsberg is to be one of the directors of the new food research nutrition institute at Leland Stanford University in California.

The Casini Dye Works, Inc., New York, has been incorporated with a capital of $5,000, to manufacture dyes, colors, etc. The incorporators are E. Johnston, A. F. Rennet and A. Casini, 194 West One Hundredth Street.

I. Levinstein & Co.
Incorporated
281 Franklin Street
Boston, Mass.

British
and
American Dyes

DUROPRENE BASE

FOR VARNISHES AND INSULATING PURPOSES. FASTER TO ACIDS, ALKALIS, CHLORINE, ETC., THAN ANY KNOWN COMPETITIVE PRODUCT.

Ballade of Exhausted Nerve Centers

Hearken to the country's cry,
  List unto its lay:
"Pass the Dyestuff bill! Defy
  Ostwald's bold array!"
Patience is a virtue, yea—
  Action's finer still;
While the sun shines, gather hay.
  Pass the Dyestuff bill!

What though G. H. Moses sigh?
  What though he inveigh?
Drop a line to Frelinghuy—
  Sen(d) it on its way;
Write to Nicholas, to-day,
  Nugent, Boies or Will,
Saying, "Honored Sir: We pray,
  Pass the Dyestuff bill."

"We must quickly do to dye,"
  Scientists convey,
Argue, tell us, testify,
  Asservate and say.
Why should ruinous delay
  Block the measure still?
Cease this bickering; obey.
  Pass the Dyestuff bill.

L'ENVOI

Lordly Solons, Nation's Stay,
  Legislative Mill,
Congress, Senate, Warren—Hey!
  Pass that Dyestuff bill!

L. T. C.

NATIONAL ANNOUNCES WOOL BLUE CG, NIAGARA BLUE HW, AND NIAGARA BLUE HW CONC.

The National Aniline & Chemical Company, Inc., announces the production of a new acid blue, "National" Wool Blue CG. This new dye produces a particularly brilliant shade of blue, that will permit its use for a variety of purposes, especially for navy blues on ladies' dress fabrics, as well as for knitting yarns.

It will not stain silk, for which reason it is useful for those fabrics where silk stripe and shot effects are a feature and, owing to its property of discharging to a clear white, it will prove of interest to the textile printer.

"National" Wool Blue CG possesses excellent solubility, dyes level, and exhausts completely from the dye bath. Its fastness to rubbing, perspiration, water and hot-pressing is very good. As a shading dye in combination with a number of other "National" Acid Dyes it will be found most suitable for a wide range of fashionable blues and browns.

"National" Niagara Blue HW is one of the most important of the recent additions to the list of National's products, and for the convenience of the dyer is offered in two concentrations.

It will be found of particular value for dyeing cotton in all stages of manufacture, and is also useful for dyeing mixtures of cotton and wool. "National" Niagara Blue HW possesses satisfactory leveling and covering properties, including superior fastness to water, for which reason it is preferable to other types for dyeing blues of heavy shade on cotton fabrics of various kinds including linings, the cheaper grades of cotton backings for furniture and bookbinder's cloth. It is likewise useful for dyeing jute, straw and chip braids, artificial silks, etc. Owing to its peculiar property of dyeing vegetable fibers at reduced temperatures, it is serviceable as a "speck dye," and may be applied in the fulling mill.

BEARING OF A SYNTHETIC DYE INDUSTRY UPON OUR NATIONAL WELFARE

(*Continued from last week.*)

In addition to drugs and dyes, some of our important photographic developers owe their origin to nitrobenzole and aniline. Such are hydroquinone and metol, for example; and at the outset of our participation in the war, the shortage of metol was felt seriously, for there is little use in having photographs made of the enemy's lines from airplanes or captive balloons, unless suitable chemicals are available to develop and fix the picture.

Among the more fragrant blossoms of the benzoles tree are the synthetic perfumes. These include one of the constituents of rose perfume (phenyl ethyl alcohol), which is present also in the odor of the orange blossom, one of powerful rose-leaf aroma, some of geranium-leaf (diphenyl oxide) and of syringalike (acetophenone and methyl acetophenone) odors, and many others of delightful fragrance.

The same tree that bears these beautiful products bears also some of the deadly toxics used in the late war; such, for example, as the famous "sneeze gas" (diphenylchlorarsine) with which the Germans filled their blue cross shells, and which killed many of the allied soldiers when it was first em-

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ployed, for the older allied masks did not give complete protection against it.

Other dangerous products are the various explosives derived from benzole, such as the more highly nitrated benzoles, T. N. A. (tetranitroaniline), tetryl (tetranitromethylaniline), and picric acid. It is interesting to observe that the latter is really growing on a graft from the carbolic acid tree.

Aniline provides also one of the best stabilizers (diphenylamine) to protect smokeless propellants against deterioration, and yet this substance itself becomes a powerful explosive when sufficiently nitrated, or it may, on the other hand, be converted into some very beautiful dyes.

Like carbolic acid, aniline will unite with formaldehyde to a resinoid. The properties of the product are not such as to make it of any commercial service, but the reaection is such a simple one to carry out that we can do it here on this table. (Experiment.)

Even these manifold uses of aniline and other benzole derivatives do not begin to exhaust the lost. Aniline and divers compounds produced therefrom find application also as accelerators in the vulcanization of rubber (*e. g.* thiorcarbanilide, m-phenylene diamine, nitrosodimethylaniline), and yet further uses might be cited before the story was complete.

Toluene (Toluole)

Having examined the benzole tree somewhat critically, let us turn to the next tree in our coal-tar grove. The label on it reads "Toluene, or Toluole," and it is the next older brother to benzole, belonging in the same family and having all the family traits and characteristics, plus a few peculiarities of its own. In size and development it is almost as imposing as benzole.

As toluene is the raw material for the manufacture of the important explosive T. N. T., every effort was made during the war to increase our ouput of this crude by installing additional by-product coke ovens and by "stripping" illuminating gas, as well as by other processes, with the result that for the calendar year 1918 our total output was over 12,000,000 gallons, valued at over $18,000,000. With the cessation of the war the demand and price fell precipitately, the production of pure toluene for 1919 being estimated at about 1,000,000 gallons, practically all of which went to the manufacturers of dyes, dye intermediates and medicinals.

Let us consider briefly some of the intermediates and final products which owe their origin to this crude.

As in the case of benzole, our toluene can be nitrated, giving nitro toluenes, which on reduction yield compounds (toluidines) similar in properties, utilization and possibilities to aniline. The nitration products include the T. N. T. noted above, other explosives, and one of the best of the synthetic musks, of powerful musk-like odor but, so far as we now know, not identical with the odoriferous constituent of the real musk from the musk deer. The toluidines yield dyes, drugs, etc., much in the same manner as aniline, but having already followed out such a branch in the case of benzole, let us take a different one here—one inscribed "Chlorotoluenes."

When toluene is treated with chlorine, under proper condtions, some of the hydrogen it contains is driven out and the chlorine takes its place, new compounds being formed.

One of these (benzyl chloride; 1919 production 720,953 pounds, worth $166,182) is used for the manufacture of dyes known as Benzyl Violets, and is also the source of one of the most potent lachrymatory gases of the war (brombenzyl cyanide), which was prepared by acting upon it first with cyanide of potassium and then subjecting the product so obtained to the bromine extracted from the brine wells of Michigan or of the Ohio River Valley. Strange as it may seem, if instead of using bromine we carry this intermediate product through a different series of reactions, the result is a wonderfully fragrant perfume possessing in high degree the delicious scent of the hyacinth and narcissus, and entirely free from any lachrymatory effect.

Another one of our chlorination products from toluene (benzal chloride), when boiled with lime gives the chief constituent of the oil of bitter almonds (benzaldehyde), which is better than the natural product in certain respects and is used as a substitute for it (1919 production of benzaldehyde, 518,634 pounds, valued at $403,109). From this synthetic oil of bitter almonds, many compounds are prepared which contribute to the happiness of our people. One of these is the popular dye called Malachite Green, of which we made 560,301 pounds in 1919, valued at $1,827,474. Another is synthetic oil of cinnamon, identical with the substance present in the natural oils of cinnamon and cassia, and to which they owe their characteristic odor and taste. It is consequently sold as a substitute for the natural article, and the value of the natural oil is decided commercially by the percentage of this substance present. Other products obtained from synthetic oil of bitter almonds include certain of the perfume substances actually present in orange blossoms, jasmine, tuberose, gardenia and ylang ylang, as well as purely artificial compounds of the odor of moss roses, of hyacinths and of narcissus.

When boiled with a strong solution of caustic potash, our oil of bitter almonds changes to two other bodies. One of these is benzoic acid, of which I shall have more to say in a moment. The other is a mobile colorless liquid, related chemically to ordinary alcohol, and which is itself the source of drugs and perfumes. These two products can be made to unite to a totally different one (benzyl benzoate), which is a heavy oily liquid and which has the valuable property, when added to the "dope" or varnish for airplane wings, of causing this coating to dry slowly and harden without cracking, and it is hence called a "restrainer."

Whereas, as just described, one of the products obtained by the action of chlorine upon toluene yields oil of bitter almonds when boiled with lime, there is a third one of these chlorination products (benzo trichloride) which when treated in the same way gives benzoic acid instead, and this is one of the chief commercial methods for the manufacture of this important compound (1919 production, 699,108 pounds = $534,832). The synthetic product is identical with that obtained from storax, balsams of Peru or Tolu (whence the name toluene), or from other natural sources. It finds employment as a food preservative (in the form of its sodium salt), and in the manufacture of dyes and perfumes, as well as of the production of such drugs as procaine (novocaine), anesthesine, barbital (veronal), chloramine-T and dichloramine-T.

Another branch from our toluene tree is marked "Sulpho derivatives," and it bears that remarkable sweetening principle, "Saccharin," four pounds of which will sweeten as much coffee as a ton of ordinary sugar. It is the sweetener customarily used by those people suffering from diseases which would be aggravated by cane sugar.

Xylene (Xylole)

Standing next to benzole and toluene, and members of the same family, is a group of triplets, the three xylenes, whose first names are Ortho, Meta and Para. Like other triplets, they are so fond of one another that it is not easy to separate them, and as they are so much alike in appearance and general behavior this is not necessary in many cases. They are found in that fraction of coal tar sold under the name of "solvent naphtha" which, as its name

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suggests, finds its major use in industry as a solvent.

Although the source of many beautiful dyes, and of other useful products, and possessing still greater possibilities than either benzole or toluene, the xylenes, largely because of the difficulty of separating them, have not achieved anything like the same development, and we will not tarry longer to examine them more closely.

Naphthalene

Turning now from the benzene family, we see another huge tree of wide-spreading habit and massive trunk, but of somewhat different appearance. Its tag reads 'Naphthalene." It is brilliant with a fruitage of dyes of every conceivable shade, with only here and there a drug, perfume, or explosive.

It is worth noting that we use this crude, in the form of moth balls, to protect against insect ravages textiles which may be dyed with naphthalene dyes.

Not many years ago, naphthalene was the starting point for the manufacture of synthetic indigo, but it is now more economical to use aniline for this purpose. One of the intermediate products in this older process, when combined with wood alcohol, is converted into a perfume substance which is found in the flowers of the orange, jasmine, tuberose and narcissus.

Anthracene

Another very important crude is Anthracene. Although as yet not the parent of such a numerous crop as either benzole, toluene or naphthalene, it is, however, the origin of some of the finest and fastest dyes in the world to-day, particularly in the class of vat dyes, a group to which by the way indigo belongs. The peculiarity of vat dyes is that on reduction they yield a soluble form of dye which thoroughly permeates and penetrates the fiber, and which on oxidation in the air separates the dye itself in an insoluble form within the fiber, extremely fast to light, washing and bleaching. As the operation is generally carried out by steeping the goods in a vat filled with the reduced dye, the process is termed vat dyeing.

Unfortunately, anthracene is one of the few really important crudes of which we still lack an adequate supply, and this is one reason why these dyes have been among the last to be manufactured here. In 1918, the actual anthracene contained in the crude product marketed was about 250,000 pounds, but very little of it was refined so as to make it available for the preparation of dyes, for which purpose it must be at least 80 per cent pure. The output in 1919 was more than three times as much (813,318 pounds), and a large proportion of it was refined, but it is roughly estimated that had it all been refined there would have been only about one-fifth the amount required for our domestic market, assuming those needs to be in the neighborhood of 4,000,000 pounds pure anthracene per annum.

(To be continued.)

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